

**CLAIMS**

1. An air monitoring system, comprising:
  - an air monitoring unit including at least one sensor for acquiring air quality parameter data; and
    - a computer having including an expert system for controlling the air monitoring unit based at least in part on the acquired air quality data.
2. An air monitoring system of claim 1, wherein the expert system is adapted
  - 10 to analyze data from the air monitoring unit based at least in part on the acquired air quality data.
3. The air monitoring system of claim 1, further comprising:
  - 15 a monitor for environmental data;
  - wherein the expert system is adapted to provide an air quality analysis based at least in part on the acquired air quality data and the environmental data.
4. The air monitoring system of claim 1, wherein:
  - 20 wherein the expert system is adapted to configure a test to be performed by the air monitoring unit including the location of the test and the time duration for the test.
5. The air monitoring system of claim 1, wherein the expert system is adapted to provide a recommendation for improving the air quality parameter data.
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6. The air monitoring system of claim 1, wherein the unit is portable.
7. The air monitoring system of claim 1, wherein the expert system is provided within the air monitoring unit.
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8. The air monitoring system of claim 1, wherein the air monitoring unit includes a program for acquiring the air quality parameter data and the expert system is adapted to modifying the program.

5 9. An air monitoring system, comprising:  
an air monitoring unit including at least one sensor for measuring air  
quality parameter data;  
wherein the air monitoring unit is adapted to download information from  
a remote data center through a communication link to modify the function of the air  
10 monitoring unit.

10. The air monitoring system of claim 9, wherein the air monitoring unit is  
adapted to upload air quality parameter data and download information automatically  
from a remote data center through a communication link.

15 11. The air monitoring system of claim 9, wherein the air monitoring unit is  
adapted to download additional characteristics regarding a structure being sensed from  
the remote data center.

20 12. The air monitoring system of claim 9, wherein the air monitoring unit is  
adapted to download information capable of commanding the air monitoring unit to  
measure air quality parameter data at different times.

25 13. The air monitoring system of claim 9, wherein the air monitoring unit is  
programmed with operational parameters.

14. The air monitoring system of claim 13, wherein the air monitoring unit is  
adapted to download information to the air monitoring unit capable of changing the  
operational parameters of the air monitoring unit.

30 15. The air monitoring system of claim 9, wherein the communications link  
includes the Internet.

16. An air monitoring system, comprising:  
an air monitoring unit having including at least one sensor for measuring  
air quality parameter data, and a computer for storing the data received from the sensor;  
a remote data center including a database for storing the air quality  
5 parameter data and receiving inputted characteristics, and an expert system interactive  
with the air quality parameter data for analysis of the data in relation to certain inputted  
characteristics; and  
a communication link between the data center and the air monitoring unit;  
wherein the remote data center downloads information to the air monitoring unit  
10 through the communication link to modify the function of the air monitoring unit.
17. The air monitoring system of claim 16, wherein the expert system  
generates the information, and is adapted to download the information to the air  
monitoring unit.  
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18. The air monitoring system of claim 16, wherein the expert system is  
adapted to download information to the air monitoring unit to command the air  
monitoring unit to take a grab sample.  
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19. The air monitoring system of claim 16, wherein the air monitoring unit  
includes operational parameters, and the expert system is adapted to download  
information to the unit to change the operational parameters.
20. The air monitoring system of claim 16, wherein the air monitoring unit  
25 includes a program to instruct the air monitoring unit in measuring air quality parameter  
data, and the expert system is adapted to download information to the air monitoring unit  
to change the program.
21. The air monitoring system of claim 16, wherein the air monitoring unit  
30 includes a set-up parameter, and the expert system is adapted to change the set-up  
parameter in the air monitoring unit.

22. The air monitoring system of claim 16, wherein the communications link includes the Internet.

23. An air monitoring unit, comprising:

5 at least one removable card including at least one sensor and a shroud enclosing the sensor; and  
enclosing the sensor; and  
a conduit connected to the shroud.

10 24. The air monitor unit of claim 23, further comprising a closed air path at least partially through the shroud.

15 25. The air monitor unit of claim 24, wherein at least one sensor is located within the closed air path.

20 26. The air monitor unit of claim 25, wherein the shroud has an inlet within the closed air path to allow air into the shroud and an outlet exiting the closed air path to allow the air out of the shroud.

27. The air monitor unit of claim 26, wherein the shroud surrounds the sensor and a plenum is located within the shroud adjacent the air inlet to direct air substantially smoothly through the shroud.

25 28. The air monitoring unit of claim 22, further comprising a standardized electrical interface to support at least two sensor cards.

29. The air monitoring unit of claim 23, further comprising a sensor for counting airborne particles of one or more size ranges; and having at least one sensor for air monitoring purposes.

30. The air monitoring unit of claim 23, further comprising a sensor for monitoring radon and having at least one sensor for air monitoring purposes.

31. An air monitoring system, comprising:  
an air monitoring unit including a grab sampler contained within the air  
monitoring unit for acquiring an air sample;  
a remote control unit for controlling the air monitoring unit; and  
5 a communications link between the control center and the air monitoring  
unit;  
wherein the control unit is adapted to download a command to the air  
monitoring unit to trigger the grab sampler to acquire an air sample.

10 32. The air monitoring unit of claim 31, wherein the grab sampler includes a  
sorbent tube.

15 33. The air monitoring unit of claim 31, wherein the grab sampler includes a  
container for holding a sample of air.

34. Apparatus comprising:  
an air monitoring system having at least one sensor for acquiring air  
quality data at a selected indoor location; and  
a computer comprising an expert system for analyzing the acquired air  
20 quality data and reaching a conclusion regarding air quality of the selected indoor  
location.

35. Apparatus as defined in claim 34, wherein the computer comprising the  
expert system is a part of the air monitoring system.

25 36. Apparatus as defined in claim 34, wherein the computer comprising the  
expert system is remotely located from said air monitoring system.

30 37. Apparatus as defined in claim 34, wherein said means for analyzing the  
acquired air quality data further comprises means for analyzing information  
representative of the selected indoor location in reaching said conclusion.

38. Apparatus as defined in claim 34, wherein said expert system comprises two or more experts for determining intermediate results and an expert coordinator for combining said intermediate results to reach said conclusion.

5       39. Apparatus as defined in claim 34, wherein said expert system includes means for making a recommendation for improving the air quality of the selected indoor location.

10      40. Apparatus as defined in claim 34, wherein said expert system includes means for controlling operations of said air monitoring system.

15      41. Apparatus as defined in claim 34, wherein said expert system includes means for modifying operation of the air monitoring system in response to the acquired sensor data.

20      42. Apparatus as defined in claim 34, wherein said air monitoring system further comprises an air sampling device and wherein said expert system includes means for issuing a command to said air sampling device to acquire an air sample in response to the acquired sensor data meeting a predetermined criteria.

25      43. Apparatus as defined in claim 34, wherein said air monitoring system comprises a portable air monitoring unit that is easily movable to different selected indoor locations.

25      44. Apparatus as defined in claim 34, wherein said air monitoring system comprises an installed system for monitoring air quality in multiple indoor locations.

30      45. Apparatus comprising:  
                an air monitoring system comprising at least one sensor for acquiring air quality data at a selected indoor location; and  
                a control site for controlling operation of the air monitoring system through the Internet.

46. Apparatus as defined in claim 45, wherein said control site includes means responsive to information representative of the selected indoor location for downloading a customized operating program to the air monitoring system.

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47. Apparatus as defined in claim 45, wherein said control site includes means responsive to information representative of the selected indoor location for downloading customized operating parameters to the air monitoring system.

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48. Apparatus as defined in claim 45, wherein said control site includes means for modifying the operation of the air monitoring system in response to the acquired sensor data.

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49. Apparatus as defined in claim 45, wherein said control site further comprises an expert system for analyzing the acquired sensor data and reaching a conclusion regarding air quality of the selected indoor location.

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50. Apparatus as defined in claim 45, wherein said air monitoring system further comprises an air sampling device and wherein said control site includes means for issuing a command to said air sampling device to acquire an air sample in response to the acquired sensor data meeting a predetermined criteria.

51. Apparatus as defined in claim 45, wherein said air monitoring system comprises a portable air monitoring unit that is movable to different indoor locations.

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52. Apparatus as defined in claim 45, wherein said air monitoring system comprises an installed system for monitoring air quality in multiple indoor locations.

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53. An air monitoring unit comprising a plurality of sensors for acquiring sensor data representative of air quality at a selected indoor location and a control unit adapted for receiving through the Internet a customized operating program for monitoring air quality at the selected indoor location.

54. A method for monitoring indoor air quality comprising the steps of:  
providing information representative of a selected indoor location to a  
remotely located control unit;  
positioning an air quality monitoring unit in the selected indoor location;  
5  
downloading customized operating information from the control unit to  
the air quality monitoring unit; and  
monitoring the air quality at the selected location in accordance with the  
customized operating information.

10 55. A method as defined in claim 54, wherein the step of providing  
information comprises entering the information at a personal computer and transmitting  
the information from the personal computer to the remotely located control unit.

15 56. A method as defined in claim 54, wherein the step of positioning an air  
quality monitoring unit comprises positioning a portable air monitoring unit at different  
selected locations in a building.

20 57. A method as defined in claim 54, wherein the step of downloading  
customized operating information comprises downloading a customized operating  
program to the air quality monitoring unit.

58. A method as defined in claim 54, wherein the step of downloading  
customized operating information comprises downloading customized operating  
parameters to the air quality monitoring unit.

25 59. A method as defined in claim 54, wherein the step of downloading  
customized operating information comprises downloading a command for initiating  
acquisition of an air sample.

30 60. A method as defined in claim 54, wherein the step of downloading  
customized operating information comprises downloading modifications to previously  
downloaded operating information.

61. A method as defined in claim 54, wherein the step of downloading customized operating information is performed by transmitting the customized operating information through the Internet.

5 62. A method as defined in claim 54, further comprising the step of uploading acquired air quality data from the air quality monitoring unit to the remotely located control unit.

10 63. A sensor card for use in an air quality monitoring system, comprising:  
a card having a connector for electrical connection to the air quality monitoring system; and

an air quality sensor mounted on said card for providing sensor data through said connector to the air quality monitoring system.

15 64. A sensor card as defined in claim 63, further comprising a shroud mounted on said card for defining an air flow path to said air quality sensor, said shroud having an inlet and an outlet.

20 65. A sensor card as defined in claim 64, further comprising a perforated divider mounted in said shroud for controlling air flow through said shroud.

66. A sensor card as defined in claim 64, further comprising means for producing a substantially laminar air flow through said shroud.

25 67. A sensor card as defined in claim 64, wherein the inlet and outlet of said shroud are provided with quick disconnect connectors.

68. A sensor card as defined in claim 63, further comprising electronic circuitry mounted on said card and coupled to said air quality sensor.

30 69. A sensor card as defined in claim 68, wherein said electronic circuitry provides an electrical interface to the air quality monitoring unit.

70. An air quality monitoring system comprising:  
at least one air quality sensor for acquiring sensor data at a selected indoor  
location;  
a control unit for generating a grab sample command in response to the  
acquired sensor data meeting a predetermined criteria; and  
a grab sample unit for acquiring an air sample at the selected indoor  
location in response to the grab sample command from the control unit.

71. An air quality monitoring system as defined in claim 70, wherein said  
control unit is located in proximity to the air quality sensor and the grab sample unit.

72. An air quality monitoring system as defined in claim 70, wherein said  
control unit is remotely located from the air quality sensor and the grab sample unit.

73. An air quality monitoring system as defined in claim 72, wherein the  
control unit communicates with the air quality sensor and the grab sample unit through  
the Internet.

74. An air quality monitoring system as defined in claim 70, wherein said  
grab sample unit includes a filter unit for removing particles from the air sample.

75. An air quality monitoring system as defined in claim 70, wherein said  
grab sample unit comprise a sorbent material for removing gases from the air sample.

76. An air quality monitoring system as defined in claim 70, wherein said  
grab sample unit is configured for acquiring multiple air samples in response to multiple  
grab sample commands from said control unit.

77. An air quality monitoring system as defined in claim 70, wherein said  
control unit comprises an expert system for analyzing the acquired sensor data and  
generating the grab sample command.

78. An air quality monitoring unit comprising:  
a housing;  
a plurality of easily removable air quality sensors mounted in said  
housing; and

5 a programmable control unit having an interface to said air quality  
sensors, wherein said control unit is programmable so as to customize the air quality  
monitoring unit for operation with different sensors.

10 79. An air quality monitoring unit as defined in claim 78, wherein each of  
said air quality sensors is mounted on a sensor card plugged into a card cage in said  
housing.

15 80. An air quality monitoring unit as defined in claim 78, further comprising a  
manifold for transporting air from an inlet to said air quality sensors.

81. An air quality monitoring unit as defined in claim 80 further comprising  
at least one sensor located in said manifold near said inlet for sensing a parameter that  
changes rapidly.

20 82. An air quality monitoring unit as defined in claim 80 further comprising a  
vacuum pump for drawing air through said inlet to said plurality of air quality sensors.

25 83. An air quality monitoring unit as defined in claim 78, further comprising a  
grab sample unit for acquiring an air sample in response to a grab sample command from  
said control unit.

84. An air quality monitoring unit as defined in claim 78, wherein said control  
unit includes an Internet interface for receiving operating information through the  
Internet.

30 85. An air quality monitoring unit as defined in claim 78, wherein said  
housing is readily movable to different monitoring locations.

86. An air quality monitoring unit as defined in claim 78, wherein said control unit includes a GPS system for providing location information to the control unit.

87. An air quality monitoring unit as defined in claim 78, further comprising a  
5 sensor interface card coupled between said quality sensors and said control unit.